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अंतर्दाही इंजन — ईंधन अंतःक्षेपण नोज़ल

भाग 2 अंशशोधन नोज़ल, विलम्ब पिन्टल टाइप

(पहला पुनरीक्षण)

Indian Standard

INTERNAL COMBUSTION ENGINES — FUEL INJECTION NOZZLES

PART 2 CALIBRATING NOZZLE, DELAY PINTLE TYPE

(First Revision)

ICS 43.180

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

February 2006 **Price Group 4**

Automotive Primemovers, Transmission and Steering Systems and Internal Combustion Engines Sectional Committee, TED 2

NATIONAL FOREWORD

This Indian Standard (Part 2) (First Revision) which is identical with ISO 4010 : 1998 'Diesel engines — Calibrating nozzle, delay pintle type' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendation of the Automotive Primemovers, Transmission and Steering Systems and Internal Combustion Engines Sectional Committee and approval of the Transport Engineering Division Council.

This standard was first published in 1997. The first revision of the standard was taken due to revision to base standard.

The Sectional Committee decided to align the Indian Standards with the corresponding International Standards wherever feasible and wherever the domestic considerations were not so intense as to have standards different from the ISO Standards. This decision was taken with a view to upgrade the quality of the products in line with the International Standards.

The following technical changes have been incorporated:

a) Scope has been elaborated including field of application up to 150 mm^3/Stroke.

b) Two different methods for determining the clearance at the pintle of needle (Method 1) and clearance at the needle guide (Method 2).

c) Clause for Dimensions is changed to 'Dimensions and tolerances'.

d) A new test method to determine the clearance at the needle guide is introduced.

The text of the ISO Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

The standard is one in the series of standards on fuel injectors. Other standard published in this series is:

IS No.	*Title*
IS 3170 (Part 1) : 2006/ ISO 2697 : 1999	Internal combustion engines — Fuel injection nozzles: Part 1 Injection nozzles — Size 'S' (*second revision*)

For BIS Certification Marking, details are given in National Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

INTERNAL COMBUSTION ENGINES — FUEL INJECTION NOZZLES

PART 2 CALIBRATING NOZZLE, DELAY PINTLE TYPE

(First Revision)

1 Scope

This International Standard specifies a nozzle intended for the testing and setting of injection pumps on injection pump test benches. It specifies the dimensions and test methods for determining the clearance at the "pintle" of the needle (method 1) and the clearance at the needle guide (method 2).

The exact limit of the application of the calibrating nozzle depends upon the test values specified for the injection pump. The applicability is to be verified in each case by the pump manufacturer and stated on the pump test specification for each pump type. The typical range is up to 150 mm^3/stroke.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 2697:—1), *Road vehicles — Fuel nozzles — Size "S".*

3 Designation and marking

The nozzle designation shall be marked on that part of the shank which protrudes beyond its cap nut. This designation is the number of this International Standard; i.e. ISO 4010.

4 Dimensions and tolerances

Dimensions and tolerances are given in figure 1.

All other dimensions of the nozzle, except the clearance at the needle guide, shall be as specified in ISO 2697 for type B. However, the two dowel holes are dropped.

The clearance of the needle in its guide shall be determined by the method given in 5.3.

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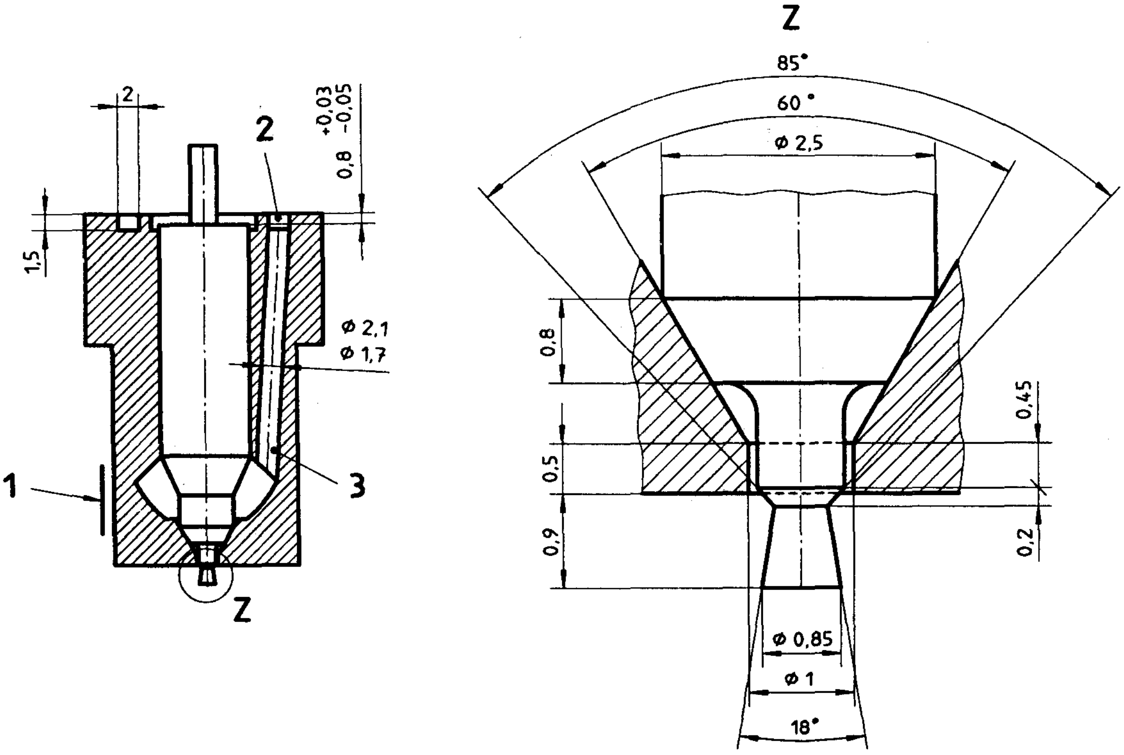
1) To be published. (Revision of ISO 2697:1974)

Dimensions in millimetres



Key

1 Nozzle designation
2 Annular groove
3 Three holes

Figure 1 — Nozzle cross-section

5 Test methods

5.1 General

All measurements of the following two test methods shall be performed on clean, dry nozzles.

For the flow measurements, calibrated measuring devices with a measuring precision of ± 0,5 % of the value indicated shall be used.

5.2 Test method 1: Clearance at the "pintle"

Method 1 measures the clearance between the needle protrusion (pintle) and the nozzle hole in the nozzle body by air flow.

5.2.1 Flow characteristics for air

When measuring with the measuring installation given in figure 3, the calibrating nozzle shall achieve the control values given in table 1.

Table 1 — Control values

Needle lift mm	Flow cm³/min	 l/h
0,1	120 to 220	
0,35	< 400	
0,5	> 600	
Lift at maximum flow		228 to 238
End of lift		210 to 220

The values indicated in table 1 are based on

— an ambient pressure p_a of 0,98 bar[2];

— an ambient air temperature t_a of + 20 °C.

A characteristic course of the air flow versus the needle lift is shown in figure 2.

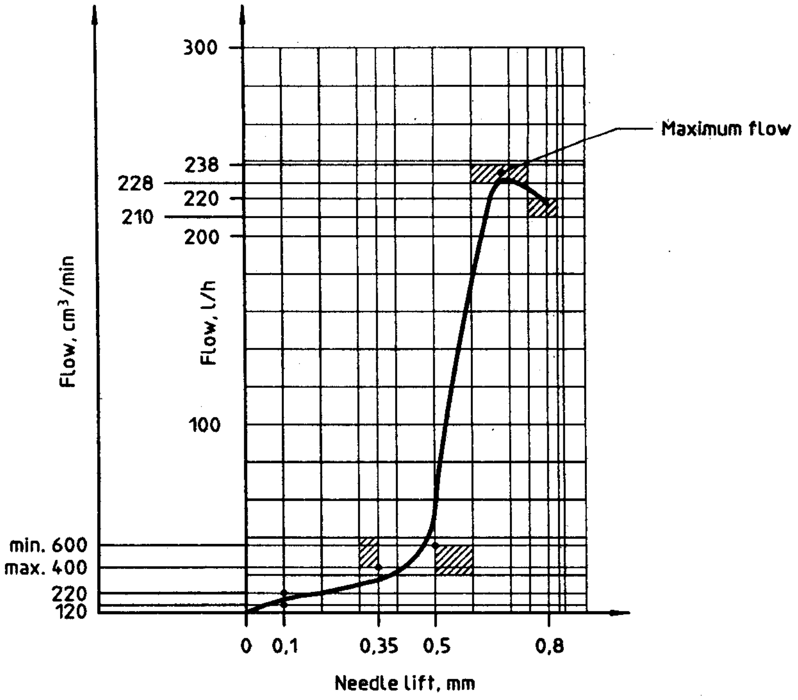


Figure 2 — Flow diagram

5.2.2 Measuring conditions

The flow indicated by the measuring device is proportional to the effective cross-section of the nozzle, if sound velocity is reached in the effective cross-section and at the outlet of the nozzle.

In order to ensure that this always happens in practice, a pressure (p_e) of at least 0,6 bar[2] below the ambient pressure (p_a), shall always be available at the nozzle outlet when measuring.

At the needle lifts of 0,1 mm and 0,35 mm the pressure at the nozzle outlet shall be at least 0,8 bar[2] below the ambient pressure.

---

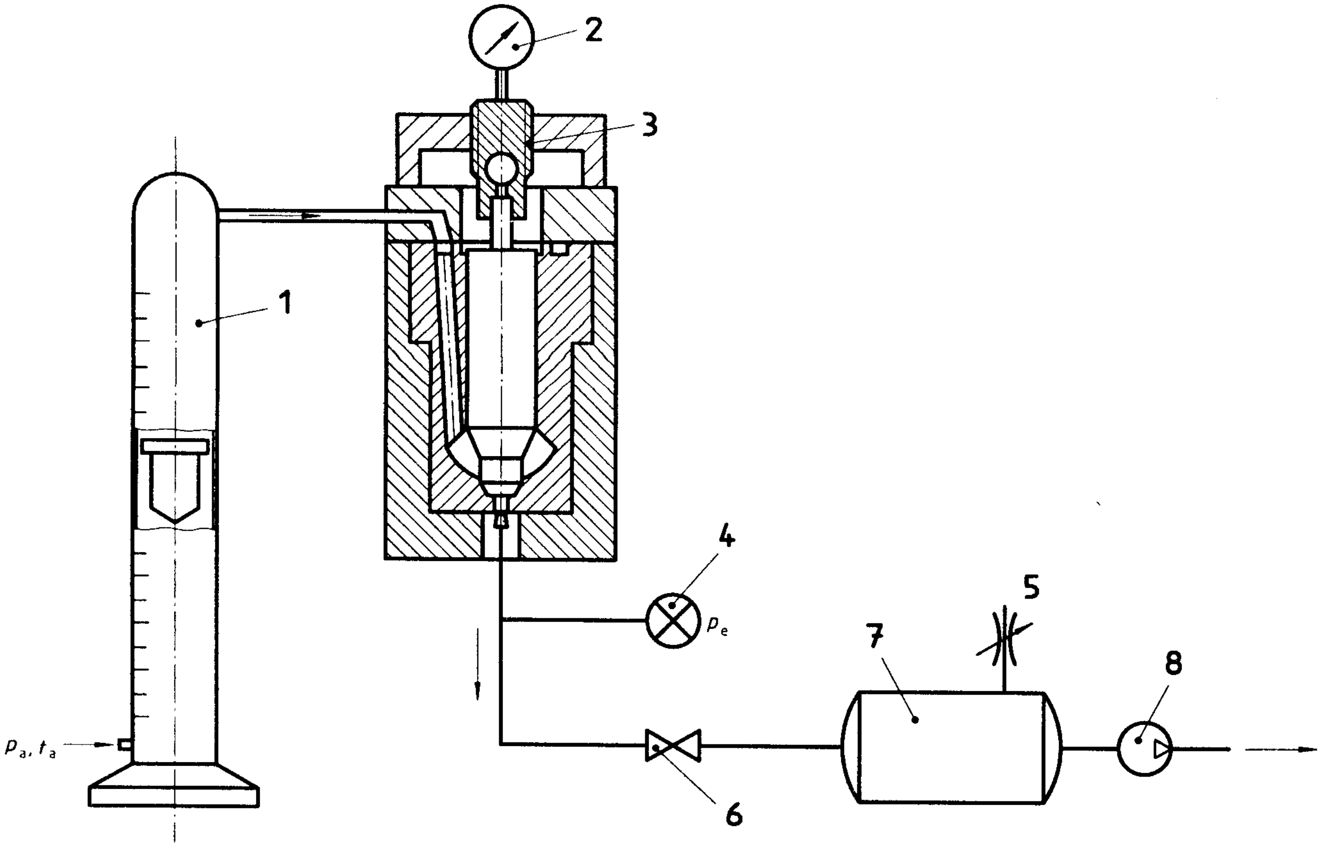
[2] 1 bar = 10^5 N/m^2

The value indicated by the flowmeter depends upon the ambient conditions at the measuring site during the measurement (pressure, air temperature).

To obtain comparable results, the reading of the flowmeter shall be corrected to the calibrating conditions of the flowmeter manufacturer. This corrected value shall, in addition, be corrected to the conditions of this International Standard upon which the diagram in figure 2 is based (pressure: 0,98 bar[2]; temperature: + 20 °C) according to the laws of thermodynamics.

5.2.3 Measuring installation

See figure 3.



Key

1 Floating body flowmeter (example)
2 Lift gauge
3 Adjustable lifting device
4 Vacuum gauge
5 Bypass
6 Stop-cock
7 Vacuum reservoir
8 Vacuum pump

Figure 3 — Measuring installation (schematic) with a floating body flowmeter

5.3 Test method 2: Clearance at the needle guide

Method 2 determines the clearance of the needle within the nozzle body by the N_2 gas-flow method.

The schematic diagram of the measuring installation and the measuring conditions are shown in figure 4.

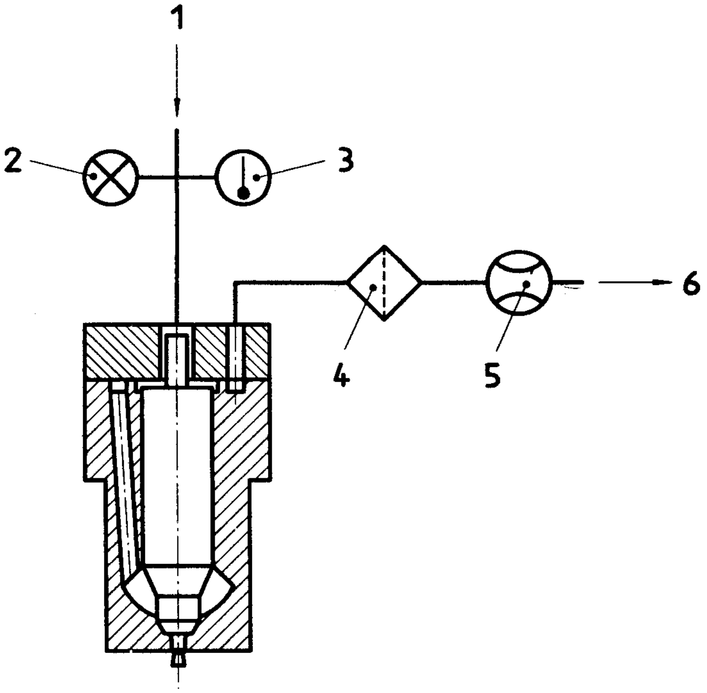
The conditions for N_2 gas flow are the following:

— pressure p: 20 bar ± 0,1 bar[2)];

— temperature t: + 20 °C at nozzle entrance.

The gas flow of new nozzles, as well as of used ones, shall be between 50 ml/min and 100 ml/min.

NOTE It is recommended to repeat the measuring procedure for the clearance twice after, in each case, turning the needle within the nozzle body at about 120°. All readings should be within the stated tolerance.



Key

1 N_2 gas
2 Pressure gauge
3 Thermometer
4 Filter
5 Flowmeter
6 Atmospheric pressure

Figure 4 — Measuring installation for N_2 gas-flow method (schematic)

Annex A
(informative)

Bibliography

[1] ISO 7440-1:1991, *Road vehicles — Fuel injection equipment testing — Part 1: Calibrating nozzle and holder assemblies.*

NATIONAL ANNEX A

(*National Foreword*)

A-1 BIS CERTIFICATION MARKING

A-1.1 The product may also be marked with the Standard Mark.

A-1.2 The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. TED 2 (425)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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